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The Effect of Race in Primary and Secondary School Achievement: Evidence from Virginia

By

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Honor Thesis

In

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University of Richmond
Richmond, VA

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Abstract

A large body of literature has studied the achievement gap between white and minority groups in the United States. This paper contributes to this discussion by conducting a cross-sectional study of Virginia using data for 2011-2012. I analyze the impact of race/ethnicity (White, Black, Hispanic) on school district pass rates conditional on income per capita, population density, and a cohort effect in each school district. I find that the magnitude of the gap is largest in 3^{rd} grade and smallest in 5^{th} grade. There are little differences between Black-White gaps and Hispanic-White gaps. The gaps are neither widening nor narrowing between 3^{rd} and 8^{th} grade. The pass rates are lowest in math and highest in science. Hispanic students generally do worse in English than Black students perhaps due to the language and cultural barriers. Income per capita and the cohort effect are generally statistically significant and quantitatively significant.

I. Introduction

In 2011, the Education Week magazine ranks Virginia 4th for its public education system nation-wide (http://www.edweek.org, accessed on March 20, 2013). However, it is not time for celebration. Even though the ranking is higher relative to other states, closing the achievement gap remains a major problem for Virginia. For example, despite being only five miles apart, the two public schools in two different school districts in Virginia face distinctive student demographic compositions and academic achievement levels. Thomas Jefferson High School is located in the Richmond City School District while Freeman High School is in Henrico County. Composed of 71% White and 13% Black students, Freeman has an 86% passing rate in mathematics in 2011. Thomas Jefferson, with a student population of 82% Black and 15% White, has a 56% passing.

The contrast between Thomas Jefferson High School and Freeman High School is not unusual. Extensive empirical research has analyzed the effect of various factors on student academic achievement gaps for decades. In particular, a large body of work has attempted to explain the Black-White academic gap. However, the gap between Hispanic and White students has not been a focus until recent years due to the increasing population of Hispanic students enrolled in public schools across the United States. In Virginia, the Hispanic student population is the third largest racial/ethnic student group. It increased from 6.5% in 2003 to 11.87% in 2011 (The Virginia Department of Education).

This study examines the academic achievement gaps between Black, Hispanic, and White students in Virginia in the school year 2011-2012. The estimation controls for socio-economic factors and school-district characteristics. The data are cross-sectional pass rates aggregated at a school district level. These rates reflect performance in English, mathematics, and science across

3rd, 5th, and 8th grades. This paper is one of a handful of studies that have analyzed the effect of race and ethnicity on student achievement in Virginia.

The findings of this paper are noteworthy in two respects. First, it is crucial to isolate the socio-economic factors from the racial/ethnic classification when explaining the achievement gaps. Within each grade, I measure the gap between subgroups (Black, Hispanic, White) in a subject. The estimated gaps indicate to which area needs more emphasis at the district level. For example, if Hispanic 5th graders perform significantly worse in English than math, there should be supplemental educational services on English for this group. Second, the study examines whether the achievement gaps expand or narrow as age increases. If the Black-White gap for 3rd grade in math is markedly smaller than that for 8th grade in math, it calls for remediation programs to bridge the gap for 8th graders. Another implication is that an early investment started in 3rd grade on a low-performing group may be able to bring the academic gap closer as students proceed to higher grades.

II. Literature Review

The "Equality of Educational Opportunity" (Coleman et al., 1966) is among the first studies to investigate the relationship between school characteristics and academic achievement. With a sample size of roughly 600,000 students across grades 1 to 12, Coleman et al. conclude that socio-economic factors play a larger role in educational outcomes than school funding. Hanushek (1981) analyzes 79 published works on the role of school expenditures. He finds that there is no relationship between expenditures and student achievement. Conventional remedies, such as reducing class sizes or hiring better-trained teachers, are not likely to improve the school performance. Minority students in general (with the exception of Asian Americans) are at a disadvantage even before first grade. Regardless of increased funding for public education, the discrepancy expands as students move to higher levels. However, Coleman et al. (1966) point out that school characteristics have more impact on minority students than majority students. The study suggests that a cohort effect exists. The proportion of the minority group may have a significant impact on the students' achievement. If a Black minority student is placed in a high-performing group, his/her performance tends to improve. Hanushek (2002) conducts a panel data study on the achievement of Texas students and finds similar results. A higher proportion of Black students reduces the achievement of Black students. However, the magnitude of the adverse effect is larger for high-performing Blacks than low-performing Blacks, Whites, and Hispanics.

The American dream is closely tied to the power of education as the ladder of opportunity. However, statistics indicate that the bottom rungs of the ladder are broken. The state of public education has not assured equal opportunities for children from all socio-economic backgrounds. The Coleman Report is the beginning of a large literature dedicated to understanding academic disparity in the United States. The public school system fails to close the achievement gap, especially for minority students. This backdrop has called for "Back to Basics" movement to raise learning beyond minimum competency. This is to be accomplished through the establishment of rigorous national education goals and state academic standards.

In 2001, the Congress authorizes the No Child Left Behind Act (NCLB). According to the U.S. Department of Education, the purpose of the act is "to ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging state academic achievement standards and state academic assessments." NCLB holds schools, educational agencies, and states accountable to bridge the achievement gap between high- and low-performing students, particularly the gaps between minority and non-minority students. Virginia implements Standards of Learning (SOL) in 1998 well before the NCLB act is passed. However, the state is still required to make certain adjustments to comply with the NCLB's assessment and accountability system. State assessments are administered in English, mathematics, science, history and social science at the end of each grade.

In 2004, the Office of General Counsel studies the achievement gap in Virginia and Maryland and concludes that even though Virginia has a highly ranked accountability system, the underperforming groups (Black, Hispanic, low-income, limited English proficiency, and disabled students) continue to face a large and persistent achievement gap compared to White students. Another study done by the Virginia General Assembly (2003) points out that race, poverty, and adult educational attainment are the three major predictors of student achievement in Virginia. Other factors include crime and violence, parental and community involvement, ability to attract and retain highly qualified teachers, class size, per pupil spending, student motivation and student expectations. My analysis takes a limited number of these factors into account. However, because the data are aggregated at the school district level, there are several individual school and student characteristics that cannot be captured.

There is a vast literature on the Black-White achievement gap. This literature finds a significant lag in test score between Black and White students that increases with age. A study by Fryer and Levitt (2004) controls for observable characteristics of the children and their parents, such as family structure, socio-economic status, and number of children's books in the home. They find that even when there is no gap in test scores among entering kindergartens, Black students lose substantial ground relative to White students by the end of the first grade.

Bond and Lang (2013) show that after correcting for measurement error, the gap stays constant from kindergarten through 7^{th} grade. In addition, the gap is largely explained by a small set of socio-demographic controls including mother's education and age at first birth, and the child's birth weight.

Recent studies examine the gap between White and other minority groups such as Hispanic, Asian, and American Indian. Phillips and Chin (2004) show that for the current test score gaps, Latino-White gaps are not as great as Black-White gaps. In addition, Latino-White gaps are larger in math than in reading. However, the magnitude of the change in these gaps between grades is small. Similarly, using data from a racially diverse school district in California, Bali and Alvarez (2004) find that Hispanic-White gaps are half the size of the Black-White gaps. The gaps widen in the early grades for Hispanic and Black students. Moreover, they conclude that there is little evidence supporting school quality as an attribute for the growing gaps at that school district. The study also suggests that family factors have more influence on Black students than White and Hispanic students as they age. Thus, Hispanic and Black students face different progress in their achievement gaps.

The study most relevant to this paper is by Clotfelter, Ladd, and Vigdor (2006). They follow 5 cohorts of students for grades 3 to 8 spanning the school year 1994/95 to 2004/05 in North Carolina. Between Black and White students, the gaps are sizable and consistent when controlling for socio-economic status. However, there is no widening or narrowing trend between 3^{rd} and 8^{th} grade. The Hispanic-White gap is smaller than the Black-White gap and it declines with time. Though this study is done at a school- and individual-specific level, it can be used as a comparison to my paper. This comparison will reveal if following an aggregate method still leads to similar results.

The majority of the current literature concludes that student achievement gaps exist between Black and White students as well as Hispanic and White students. Nevertheless, different studies find different magnitudes of these gaps and trends as students age. This paper contributes to this literature by examining the case of Virginia with more recent data from 2011-2012 at the school district level. This is relevant due to Hispanic growth. More importantly, while most studies look at English and math, this paper measures the achievement gap in science as well.

III. The Econometric Model

The model measuring student achievement contains three broad explanatory components: (1) race, (2) school district factors (SDF), and (3) socio-economic factors (SEF). In general form, the model is written as:

$$(1)\ \text{Pass}_{rijk} = f\,(\text{Race, SDF, SEF})_{rijk}$$

where Pass = the pass rate for the SOL test

Race = race/ethnicity (Black/Hispanic/White)[1]

SDF = the vector of school district factors

SEF = the vector of socio-economic factors

i = 132 Virginia school district for the school year 2011-2012

j = grade level (3^{rd}/ 5^{th}/ 8^{th})

k = subject (English/mathematics/science)

r = race/ethnicity

[1] I acknowledge that Black and White fall into the category of race while Hispanic is an ethnic group. However, in the paper, I use race and ethnicity interchangebly.

For each of the 132 school districts, there are nine observations for the pass rate of each racial group (Black/Hispanic/White). These nine observations encompass the three grade levels ($3^{rd}/5^{th}/8^{th}$) and the three subject areas (English/mathematics/science). In total, each school district has 27 observations. SDF and SEF are control vectors. SDF takes into consideration the average variation across school districts. Similar to previous studies (Coleman et al., 1996; Hanushek et al., 2002), I include a cohort effect in the SDF. At a school with Black/Hispanic as a majority, students are more likely to be surrounded by peers who come from the same educational backgrounds. Thus, they may conform to their peers' studying behaviors and attitude about school. However, if a small group of minority student is placed in a positive, highly achieving school, they are challenged to reach the norm expectation of students around them. Within SEF, there are two variables: income per capita and population density. This vector attempts to capture the parental influence (income per capita) and the characteristics of the neighborhood (population density) that may have an impact on student's performance. Although the data for those variables are gathered at the school district level, they should still capture the essence of student- and school-specific data.

The explicit form of the model is:

$$(2)\quad \text{Pass}_{rijk} = \underset{}{\beta_0}+\underset{(-)}{\beta_1(\text{Black}_{ijk})}+\underset{(-)}{\beta_2(\text{Hispanic}_{ijk})}+\underset{(-)}{\beta_3(\text{Cohort Effect}_{ijk})}+ \underset{(+)}{\beta_4(\text{Income}_i)}+ \underset{(-)}{\beta_5(\text{Density}_i)}+\xi$$

The sign below each coefficient indicates the predicted impact of each variable on the pass rate for the SOL test. Black and Hispanic students are included in the regression as binary variables. White students are the reference group. The coefficients on these binary variables are the main focus of the model. The coefficient on Black indicates the gap between Black students and their White counterparts. The same interpretation applies to the coefficient on Hispanic. If

Black-White and Hispanic-White gaps are significant, the signs for both $\beta_1$and β_2 will be negative.

The cohort effect is measured as the proportion of Black and Hispanic students in the total student population at each level in each school district. A negative sign indicates that the lower the proportion of these minority groups, the higher their pass rates are. In this case, the variable implies that the better performing schools are composed of more White students than other races or ethnicities.

Income per capita is included as an indirect measure of factors such as the level of parents' educational attainment and parental involvement in a child's education. To the extent that these factors correlate with income per capita, test score will be higher in higher income per capita districts. As income per capita increases, the achievement also rises. From classic literature to more recent literature, scholars have shown the impact of student's socio-economic factors in student' achievement (Coleman et al., 1966; Bali and Alvarez, 2004; and Bond and Lang, 2013). Nevertheless, as a cross-sectional study at the school district level, the study is limited to the average measure of the income per capita in each school district. Henrico County is a good example of the limitation of the county-based measurement. The East End side of Henrico has relatively low-income households whereas the West End has relatively high-income households.

Finally, higher population density reflects urban areas that may be concentrated with low-income and high minority student population. These are attributes commonly associated with poor-performing schools. If so, a school district located in a highly populated area is more likely to have a low achievement rate.

I experimented with two other variables but I did not include these in my final regression. They are class size and crime rate. First, the existing literature on class size effects is split. While Angrist and Lavy (1997) and Achielles et al. (1995) find statistically significant class size effects, other scholars like Hoxby (2000) do not. I originally wanted to include class size as a control variable that may reflect the attention and the time teachers could spend on each student. However, information on class size is not available at the school district level. Second, I considered the murder rate and the drug rate of each school district. These crime rates reflect the characteristics of the neighborhood around the school, but the sign of these variables was inconsistent and generally statistically insignificant.

IV. The Data

The Virginia Department of Education (VDOE) compiles data on student achievement by grade, subject, and student subgroup. I collected the pass rate in SOL test for 132 school districts in 2011-2012. The dataset includes three grades ($3^{rd}/5^{th}/8^{th}$) in three subject areas (English/mathematics/science) within three racial/ethnic subgroups (Black/Hispanic/White). I use White and the two largest minorities in Virginia in 2011: White (53.56%), Black (23.74%), and Hispanic (11.87%). A summary of descriptive statistics is provided in Table 1. Table 2 is the summary of the raw pass rates. In Table 2, the mean of the dummy variables for White/Black/Hispanic indicates the percentage of the pass rates of my sample that belong to each racial group. Therefore, 44% of the collected pass rates were from a White cohort, 34.7% were from the Black cohort, and 21.3% from the Hispanic group.

The difference among the sizes of each racial group creates a non-constant variance for the error term. The Breusch-Pagan-Godfrey test rejected the null hypothesis of homoskedasticity at a 99% confidence interval. To correct for heteroskedasticity, I weighted each observation by the number of students in each racial group in each grade at each school district.

The data on income per capita (thousand dollars per capita) and population density (hundred people per square miles) are gathered from the U.S. census data. Because of the standard deviation for both variables, there are a lot of variations from the mean. Income per capita ranges from \$15,000 to \$60,000, with a standard deviation of 8.21. This wide range reflects the difference in income per capita between Northern Virginia and South West Virginia. Population density has a 16.56 standard deviation with the mean of 975 people per square miles.

There are 3,564 observations in the sample size. I do not have the *r* record if one of the race/ethnicity does not exist in the school district. There are rural districts where Black and Hispanic students are not well represented. Therefore, valid observations are reduced to 2,671.

V. Results

Equation (2) examines the effect of race on students' achievements. The null hypothesis is that the differences in pass rates between Black and White students, and Hispanic and White students would not be significantly different from zero (H_o: p = 0). The alternative hypothesis is that there are gaps between Black and White students, and Hispanic and White students (H_1: p≠0). Table 3 presents the results of the regression. Each cell presents the estimated coefficient of each variable (White, Black, Hispanic, cohort effect, income per capita, and population density) and its p-value. The last row reports the R-squared values.

The results in Table 3 indicate that the Black-White and Hispanic-White gaps exist. The estimated coefficients for all racial binary variables across grade levels and subject levels are statistically significant at the 99% confidence level. The coefficient for White represents the average pass rate for a White student in a subject in a grade level. Because White is chosen as the reference group, the negative coefficients for Black and Hispanic represent the Black-White and Hispanic-White gaps. For instance, in column 3M, the mean pass rate for a white student in third-grade in math is 61.4%. Since the Black-White gap is -22.6, the mean pass rate for a Black student, all else equal, is 38.8%. The Hispanic-White gap is -18.4, which makes the mean pass rate for a Hispanic student 43%. The test statistics for all 9 columns indicate that a statistically significant achievement gap exists. These findings are consistent with conclusions from the literature.

The achievement gaps are the largest in 3rd grade. The gaps become smaller for 5th and 8th grades but do not disappear. The gaps neither widen nor narrow between 3rd and 8th grade. Fifth grade as a whole outperforms the other grades in both math and English. This phenomenon may be due to cohort characteristics. The conventional wisdom is that 8th graders are going through a lot of emotions from their adolescence. At this age, students are more likely to experience a lot of anxieties. In addition, they tend to disassociate themselves with their peers, teachers, and school. This attitude towards middle school may result in the poor performance in 8th grade.

Perhaps unsurprisingly, the pass rates for math across all three grades for all three races are low. The United States has lagged in its math performance compared to other developed countries. In fact, the Program for International Student Assessment ranks teenagers in the US below average in math among developed country. Since 2009, U.S. students rank at 31/65 in math by a statistically significant margin (http://www.edweek.org, accessed on May 1, 2013). On the other hand, Virginia students have higher pass rates in science. Generally, the Black-White gaps are relatively close to the Hispanic-White gaps. The largest difference in the pass rates between Black-White and Hispanic-White gaps is in 3rd grade science (5.5% difference).

Interestingly, the pass rates of Hispanic students are behind those of Black students in English and science (with the exception of 3rd grade science). This aligns with the study done by Bali and Alvarez (2004). Since English may be their second language, it is understandable that Hispanic students take more time to acquire the language and overcome the cultural barriers. They perform worse than Black students in English. Moreover, this also hinders Hispanic students to process science-specific terms, which in turn could lead to a poor performance in science. Especially, this may be true as materials get harder (in 5th and 8th grades), students are required to reach an even higher standard of comprehension.

The t-statistics for the cohort effect are mixed. The coefficients are negative and statistically significant six out of nine cases. The exceptions are consistently in math. The negative sign is consistent with the prediction. For example, in 8th grade science, the coefficient for the cohort effect is -6.58 and statistically significant at a 99% confidence level. It means that a unit increase in the proportion of the minority group on average would lead to a drop of 6.58% in the pass rate, ceteris paribus. School districts with a lower percentage of minority students are projected to have higher pass rates. This suggests that a Black student going to a school with the majority of Black students (folks who are similar to the student) does not do as well as a Black student going to a school with the majority of White students. White students are more likely to come from family in which parents are educated and concerned about their children's education. Thus, the cohort effect attempts to take into account the home environment and family background.

I originally ran the regression with income per capita, per pupil expenditure, and property tax revenue per pupil. The rationale for having all three is that each of the variables may pick up different aspect of the economic characteristics of the school district. Income per capita captures the average socio-economic background of the neighborhood. Per pupil expenditure reflects the direct funding that each school district allocates to instructional materials, maintenance, and transportation. Although higher expenditure per pupil allows the school district to have more resources to improve students' performance, the link between the two variables has been shown to be weak (Coleman Report, 1966; Bali and Alvarez, 2004). Lastly, the variation in school expenditures results from the reliance of school's funding on the local property tax. However, these three variables are likely to be multicollinear. The indication of this potential problem is provided in Table 4. Of the three variables, income per capita yields the most consistent results and the highest R-squared. Table 5 and 6 show the empirical results if I was to choose per pupil expenditure or property tax revenue per student, respectively.

The results for income per capita are quite robust, with the only exception being 5th grade science. The coefficients are statistically significant at the 95% confidence level. The magnitudes of the coefficient for income are sizeable for 3rd grade math and 8th grade across all subjects. Taking the example of 3rd grade math, the coefficient is 0.29, indicating that on average a $1000 increase in income per capita would increase the pass rate by 0.29%, all else equal. The findings are consistent with previous studies on the impact of socio-economic factors on student achievements (Coleman, 1966; Fryer and Levitt, 2004).

Population density variable does not yield consistent results. The coefficient has the anticipated sign in seven out of nine cases, but it is statistically significant in only four cases. Equation (2) makes the assumption of linearity for population density. This assumption does not convey the suburban effect. It is plausible that for extreme rural and urban school districts, the pass rates could be low. The best pass rates are more likely to belong to schools in suburban areas, where population density is at the middle of the range. I experimented with the quadratic function form and performed the joint significance test. I found no differences in the result when using the quadratic form.

The model uses the racial/ethnic dummy variables, cohort effect, income per capita, and population density to explain the variability of the pass rates around its mean. The R-squared values range as lowest in 5th grade math (48%) and highest in 3rd grade science (70.9%). Because the study is done at the school-district level, there are student-specific and school-specific variables that I cannot include in the model. Despite this caveat, the results still give an interesting picture of the role of race and ethnicity in Virginia.

VI. Summary and Conclusions

There have been a lot of efforts to close the achievement gaps since the Coleman Report 1966. Yet, 45 years later, the discrepancy in achievements still exists. It is concentrated in groups of students that can be identified. They are economically disadvantaged students, students with disabilities, and students with limited English proficiency. Moreover, beyond the class category, there is another group: the minority. My paper investigates the achievement gaps for two minority groups: Hispanic and Black. The results suggest that the gaps are substantial (ceteris paribus). However, there is no trend between 3rd and 8th grade. That means once the gaps exist, they stay consistent and can be hard to eliminate. Furthermore, the problem gets worse when the struggling students are placed in the same school. This anecdote is portrayed in the cohort effect. When these students are around similar peers, their performance tends to deteriorate. Instead, if this group is surrounded by high performing students, the minority students are more likely to improve in their achievement.

The good news is that the gaps do not get worse as students move to a higher grade. This finding suggests that policy-makers should invest in early education before the achievement gaps become a problem. Policy implementation should carefully consider the impact of school funding. Throwing money at schools, as showed in many previous articles, may not necessarily close the gaps (Hanushek, 1981). Moreover, there is a need to revamp the curriculum in math. Students are performing poorly in math in 3rd grade, then 5th grade. By the time they enter 6th grade, they may have already lost the foundation to take on new concepts required for the level of a middle school student. Last but not least, before making any policy, experts and politicians should understand what causes the achievement gaps for each subgroup. The paper mentions the role of language deficiency on the performance of Hispanic students. If that is the case, remedies to narrow the gaps for Hispanic students should not be the same as ones for Black students. They should focus on improving Hispanic students' reading comprehension and writing.

Since there are numerous factors that come into explaining the academic performance, it is ideal to carry out a study in a less aggregated level. Although the results from my study are similar to findings of previous studies, future work can explain the gaps better with data collected at a school level or even at a student level. In this way, I can narrow down the variables to be more specific and direct to the socio-economic factors (class size, school facilities and parental education). Moreover, these methods can help to reduce the likelihood of omitted variable bias in my study. Another way to further understand the trend of the gaps is to conduct a longitudinal study, similarly to the study by Clotfelter (2006). By following the same cohort of students over year, I can predict with more certainty how the gaps progress as students age. These future works will help to guide the government on the efforts of reforming public education to truly assure equal opportunity rather than equal attainment.

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Table 1. Summary Statistics

	Minimum	Maximum	Mean	SD
White	0	1.0	0.440	0.4965
Black	0	1.0	0.347	0.4761
Hispanic	0	1.0	0.213	0.4095
Cohort Effect	0	0.947	0.131	0.195
Income	15.09	60.22	26.85	8.21
Density	0.056	93.14	9.75	16.56
Observations	2671			

Table 2. Summary Statistics (for Pass Rates)

Cohort			N	Min	Max	Mean	SD
3rd grade	Math	W	131	30.95	91.13	66.06	12.54
		B	100	9.09	61.90	41.37	11.28
		H	70	23.08	83.33	55.00	14.02
	English	W	131	70.59	98.40	88.73	5.33
		B	100	30.77	100	74.60	9.62
		H	72	52.63	100	78.95	10.55
	Science	W	131	77.89	100	93.13	3.82
		B	101	53.06	95.83	79.96	7.71
		H	71	50.00	100	87.38	9.40
5th grade	Math	W	131	76.92	100	92.43	4.45
		B	106	48.78	97.98	83.63	8.87
		H	60	72.88	100	88.90	7.08
	English	W	131	73.91	100	91.01	4.90
		B	103	53.33	100	79.93	9.70
		H	73	54.55	100	87.23	9.90
	Science	W	131	75.61	100	91.87	4.49
		B	105	45.45	95.24	78.90	8.87
		H	60	55.93	100	82.46	9.16
8th grade	Math	W	128	50.00	100	86.11	10.10
		B	100	20.00	100	78.27	12.19
		H	51	50.00	100	83.46	12.01
	English	W	131	67.86	100	91.65	5.41
		B	106	50.00	100	81.78	8.34
		H	57	57.14	100	85.06	10.31
	Science	W	130	82.42	100	94.43	3.64
		B	106	57.69	100	84.48	7.85
		H	55	60.94	100	86.64	8.28

Notes: W = White, B = Black, and H = Hispanic

Table 3. Empirical Results

	3M	3E	3S	5M	5E	5S	8M	8E	8S
White	61.403 (.000)	87.947 (.000)	91.632 (.000)	91.468 (.000)	89.654 (.000)	92.059 (.000)	79.757 (.000)	86.634 (.000)	91.682 (.000)
Black	-22.554 (.000)	-10.849 (.000)	-11.300 (.000)	-8.412 (.000)	-7.871 (.000)	-11.280 (.000)	-8.305 (.000)	-6.248 (.000)	-6.598 (.000)
Hispanic	-18.389 (.000)	-11.224 (.000)	-5.702 (.000)	-7.830 (.000)	-8.348 (.000)	-14.051 (.000)	-7.961 (.000)	-6.819 (.000)	-10.567 (.000)
Cohort Effect	-4.578 (.293)	-6.608 (.004)	-4.441 (.024)	1.004 (.630)	-5.894 (.024)	-5.702 (.017)	-1.719 (.624)	-7.782 (.000)	-6.584 (.000)
Income	0.293 (.000)	0.091 (.004)	0.092 (.001)	0.064 (.028)	0.114 (.002)	0.033 (.319)	0.403 (.000)	0.233 (.000)	0.141 (.000)
Density	0.049 (.172)	-0.022 (.249)	-0.040 (.013)	-0.008 (.664)	-0.015 (.505)	0.009 (.649)	-0.199 (.000)	-0.063 (.001)	-0.053 (.002)
R-Square	0.652	0.696	0.709	0.480	0.506	0.696	0.484	0.650	0.703

Notes: 1. Numbers in parentheses indicate p-values
2. 3/5/8: grade level
3. M = Math, E = English, S = Science

Table 4. Correlation Table

		Income	PPE	TaxRev
Income	Pearson Correlation	1	.527**	.409**
	Sig. (2-tailed)		.000	.000
	N	2671	2671	2671
PPE	Pearson Correlation	.527**	1	.429**
	Sig. (2-tailed)	.000		.000
	N	2671	2671	2671
TaxRev	Pearson Correlation	.409**	.429**	1
	Sig. (2-tailed)	.000	.000	
	N	2671	2671	2671
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 5. Empirical Results with Per Pupil Expenditure (PPE)

	3M	3E	3S	5M	5E	5S	8M	8E	8S
White	66.277 (.000)	90.641 (.000)	94.022 (.000)	93.919 (.000)	94.381 (.000)	96.868 (.000)	77.806 (.000)	86.998 (.000)	92.496 (.000)
Black	-21.020 (.000)	-10.328 (.000)	-10.785 (.000)	-7.991 (.000)	-7.120 (.000)	-10.911 (.000)	-6.206 (.001)	-4.993 (.000)	-5.803 (.000)
Hispanic	-16.125 (.000)	-10.414 (.000)	-4.910 (.000)	-7.194 (.000)	-7.215 (.000)	-13.395 (.000)	-5.585 (.000)	-5.361 (.000)	-9.626 (.000)
Cohort Effect	-11.014 (.012)	-8.939 (.000)	-6.706 (.001)	-.812 (.687)	-9.204 (.000)	-7.636 (.001)	-8.557 (.018)	-12.116 (.000)	-9.395 (.000)
PPE	0.421 (.309)	-0.009 (.965)	0.031 (.867)	-0.073 (.704)	-0.171 (.480)	-0.457 (.035)	1.598 (.000)	0.746 (.000)	0.383 (.035)
Density	0.108 (.025)	0.009 (.719)	-0.013 (.536)	0.020 (.383)	0.038 (.183)	0.060 (.019)	-0.199 (.000)	-0.047 (.061)	-0.037 (.086)
R-Square	0.625	0.687	0.697	0.472	0.491	0.700	0.406	0.592	0.677

Notes: 1. Numbers in parentheses indicate p-values
2. 3/5/8: grade level
3. M = Math, E = English, S = Science

Table 6. Empirical Results with Property Tax Revenue (PTR)

	3M	3E	3S	5M	5E	5S	8M	8E	8S
White	68.735 (.000)	90.403 (.000)	94.083 (.000)	93.218 (.000)	93.057 (.000)	93.268 (.000)	89.421 (.000)	92.616 (.000)	95.232 (.000)
Black	-21.232 (.000)	-10.382 (.000)	-10.838 (.000)	-8.047 (.000)	-7.138 (.000)	-10.983 (.000)	-6.196 (.001)	-4.923 (.000)	-5.820 (.000)
Hispanic	-16.311 (.000)	-10.496 (.000)	-4.978 (.000)	-7.289 (.000)	-7.292 (.000)	-13.632 (.000)	-5.196 (.001)	-5.107 (.000)	-9.552 (.000)
Cohort Effect	-10.195 (.018)	-8.651 (.000)	-6.451 (.001)	-0.500 (.803)	-8.999 (.000)	-6.986 (.002)	-9.444 (.009)	-12.834 (.000)	-9.552 (.000)
PTR	0.052 (.047)	0.008 (.570)	0.009 (.419)	0.004 (.745)	-0.006 (.707)	-0.013 (.359)	0.089 (.000)	0.033 (.013)	0.024 (.034)
Density	0.088 (.039)	0.000 (.987)	-0.021 (.270)	0.009 (.655)	0.029 (.248)	0.034 (.138)	-0.157 (.000)	-0.017 (.439)	-0.030 (.120)
R-Square	0.629	0.688	0.698	0.472	0.490	0.696	0.399	0.583	0.677

Notes: 1. Numbers in parentheses indicate p-values
2. 3/5/8: grade level
3. M = Math, E = English, S = Science